



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/892,330	06/26/2001	Michael A. O'Connor	5181-81100	1905

7590 01/11/2005

Rory D. Rankin
Conley, Rose & Tayon, P.C.
P.O. Box 398
Austin, TX 78767

EXAMINER

MERED, HABTE

ART UNIT	PAPER NUMBER
----------	--------------

2662

DATE MAILED: 01/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/892,330

Applicant(s)

O'CONNOR, MICHAEL A.

Examiner

Habte Mered

Art Unit

2662

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____

DETAILED ACTION

1. The formal drawings submitted on 10 September 2001 are acknowledged.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1, 2, 8, 9, 14, 15, 20-22, and 28** are rejected under 35 U.S.C. 102(e) as being anticipated by Blumenau et al. (U.S. 6,665,714), hereinafter referred to as Blumenau.
3. Regarding **claims 1 and 21**, Blumenau discloses a method and apparatus for managing the availability and assignment of data in a storage system that is coupled to a network. Such a system is shown in Figures 1(c) and 3. Blumenau's storage allocation method involves setting up a configuration data. The configuration data is the association between the hosts and the individual storage (i.e. volume of data) in the storage system. See Column 1, Lines 7-9 and Column 5, Lines 23-25. Blumenau shows in his invention that when new devices are added to the system a path discovery is executed in that it queries the network to identify other devices coupled to the network. See Column 6 Lines 62-63. The configuration data (i.e. mapping of host to specific storage) and the ports associated with the host and the specific storage (i.e.

results of the path discovery) are stored in the configuration database (i.e. storage path database). See Column 9, Lines 14-35. The system administrator can initially build the storage path database (i.e. configuration database) manually during the initial stage of provisioning the Storage Area Network and continuously update the database as the need arises. See Column 6, Lines 45-55 and Column 8, Lines 13-15. Blumenau's also discloses that the system administrator functionality can be implemented in software. See Column 6, Lines 55-56. Figures 19-22 show a graphical user interface implementation of the system administration functionalities for building the storage path database.

4. Regarding **claims 2, 9, 15, and 22**, Blumenau shows in Figure 1(c) hosts coupled to a storage system using a switch. Blumenau further shows that a storage system with a first port (Port 0) is coupled to a switch fabric network 10. See Column 6, Lines 39-41. Blumenau discloses a path discovery method where each device queries the network that contains a switch as shown in Figure 1(c) to identify the other devices coupled to the network. See Column 6, Lines 62-63. Therefore a path discovery for one of the hosts coupled to the switch 10, in Figure 1c, will involve a query via the first port of the storage system and will indicate hosts 1 and 2 are mapped to the storage system via Port 0 of the storage system.

5. Regarding **claims 8, 14, 20, and 28**, Blumenau discloses that each host and storage system may include one or more ports for interfacing the host or storage system to a corresponding one or more networks. See Column 6, Lines 8-10. Figure 1(c) shows a system where a couple of hosts are coupled to a storage device using a switch. Blumenau also discloses that each device in the network will have knowledge

Art Unit: 2662

of other devices in the network in terms of their ports after the completion of the path discovery process, which involves querying the switch and devices coupled to the network. See Column 6, lines 62-67 and Column 7, Lines 1-12. A storage path database (i.e. configuration database) is initially built and continuously updated as the configuration of the network changes. See Column 9, Lines 14-21. Blumenau's invention also gives, each host, ability to access the configuration database via a GUI or via a command line interface. See Column 18, Lines 9-24 and Figures 19-22. The allocation mechanism may reside in the host as a software utility. See Column 21, Lines 48-55.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claims 3-7, 10-12, 13, 16-19, 23-27, and 29-32** are rejected under 35 U.S.C. 103(a) as being unpatentable over Blumenau (U.S. 6,665,714) in view of Blumenau et al. (U.S. 6,260,120), hereinafter referred to as Blumenau & Raz.
7. Regarding **claims 3, 10, 16 and 23**, Blumenau teaches that the storage path database is stored in the storage system.

Blumenau, however, fails to expressly disclose that the storage path database can be stored locally in the host.

Blumenau & Raz disclose that the retrieved volume access table (i.e. storage path database) can be stored locally within the host. See Column 32, Lines 43-45.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate an option to store the database locally in the host, the motivation being to address the need for a method that is transparent to any high-level storage system procedures that may be used by the hosts for managing access to data stored in the storage system to which a host is only permitted to access.

8. Regarding **claims 4, 11, 17, and 24**, Blumenau teaches that the storage path database can be stored in the storage system. Blumenau shows that the configuration database, block 32, (i.e. storage path database) is stored in the storage system 20 in Figure 3. See also Column 9, Line 14.

Blumenau, however, fails to expressly disclose that the storage path database can be stored in the storage system as well as locally in the host.

Blumenau&Raz discloses that the storage path database is stored in the storage system and the host has a local copy. See Column 32, Lines 43-47.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate an option to store the database locally in the host, the motivation being increase in efficiency by allowing the hosts limited involvement in storage allocation and fast access to storage mapping data pertinent to the hosts.

9. Regarding **claims 5, 12, 18, and 25** Blumenau teaches a method of storage allocation in a system that has a plurality of hosts coupled to a storage system using a switch. Such a system has a storage path database that contains the mapping between a given host and a storage unit and the path between the host and the storage unit. When a new host is mapped to a storage system a query is conducted to determine appropriate path.

Blumenau, however, fails to expressly disclose the recovery steps required in validating the mapping between a host and a storage unit after the host has experienced a failure.

Blumenau & Raz disclose the volume access table (i.e. storage path database) contains the relationship between hosts and respective lists of volumes of storage accessible to the hosts. See Column 14, Lines 29-31. Blumenau & Raz disclose that when the host's state changes (e.g. system boot after host failure), then the host controller port will transmit its state change to the storage system and the storage system will access the volume access table (i.e. storage path database) and reestablish the relationship of the host controller port's volume group name and volume list with respect to its new 64 bit port identifier (WWN) and source id (S_ID). As a result, as shown in Figure 5, the volume group name (i.e. host name or id) and the associated volume list (storage unit) is re-mapped. See Column 15, Lines 24-36. The host is also able to do the re-map of storage to host after reboot. See Column 33, Lines 50-63.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate a method for handling

Art Unit: 2662

host failures, the motivation being an improved data storage system with fault tolerance and failover capability.

10. Regarding **claims 6, 13, 19, and 26**, Blumenau teaches a method of storage allocation in a system that has a plurality of hosts coupled to a storage system using a switch. Such a system has a storage path database that contains the mapping between a given host and a storage unit and the path between the host and the storage unit. When a new host is mapped to a storage system a query is conducted to determine appropriate path.

Blumenau, however, fails to expressly disclose the recovery steps required in validating the mapping between a host and a storage unit after the host has experienced a failure. Specifically it fails to disclose if any checks are performed on the storage database after the database is retrieved as a result of detecting a host failure. Blumenau fails to disclose the measures to be taken if the check on the storage database indicates an error.

Blumenau & Raz discloses in Figure 17 a flowchart for the storage system port adapter when notified of a network state change such as host controller boot. After the volume access table (i.e. storage path database) is accessed in step 182, a set of checks in steps 183 and 186 are performed to validate the content of the table. In step 187 in Figure 17, if the database has invalid entries then a notification is sent to the System administrator. Blumenau & Raz disclose that each host has the ability to boot from local disk and do volume and topology reconfigurations (i.e. re-map storage to

host) and in effect be able to do the steps indicated in Figure 17. See Column 32, Lines 43-45 and Column 33, Lines 13-22.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate an option for validating the storage database during recovery from a host failure, the motivation being preventing database corruption and ensuring system integrity.

11. Regarding **claims 7 and 27**, Blumenau teaches a method of storage allocation in a system that has a plurality of hosts coupled to a storage system using a switch. Such a system has a storage path database that contains the mapping between a given host and a storage unit and the path between the host and the storage unit. When a new host is mapped to a storage system a query is conducted to determine appropriate path.

Blumenau, however, fails to expressly disclose the recovery steps required in validating the mapping between a host and a storage unit after the host has experienced a failure. Specifically it fails to disclose if any check should be performed, that involves accessing the storage system, after the database is retrieved as a result of detecting a host failure. Blumenau fails to disclose the measures to be taken if the storage is inaccessible.

Blumenau & Raz disclose that it is possible to back up and restore the host-to-volume connectivity configuration information (i.e. host to storage mapping). See Column 45, Lines 3-5. The flowchart in Figure 17 is one way to accomplish host to storage re-mapping after a host failure. After a host is brought back into service after a failure, like any other device being entered in the network, a path discovery process is

initiated as explained in the arguments for claim 2. The host as part of the path discovery interrogates the storage system for the 64-bit port identifier (WWN), which constitutes as an attempt to establish communication and access the storage system. See Column 36, Lines 58-60 and Column 33, Lines 24-27. Blumenau & Raz unambiguously disclose that the host is always responsible for establishing communications with the storage system. See Column 45, Lines 10-11. It is inherent in any software-based system, such as Blumenau's & Raz's that any failures in testing a sub-system such as accessing storage will result in an error notification.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate a method that involves a test procedure to access storage allocated to a host during recovery from a host failure, the motivation being an improved data storage system with fault tolerance and failover capability.

12. Regarding **claims 29, 30, 31, and 32**, Blumenau discloses a method for managing the availability and assignment of data in a storage system that is coupled to a network. Such a system is shown in Figures 1(c) and 3. Blumenau clearly shows in Figure 1(c) hosts coupled to a storage system using a switch. Blumenau further shows that a storage system with a first port (Port 0) is coupled to a switch fabric network 10. See Column 6, Lines 39-41. Blumenau's storage allocation method involves setting up a configuration data. The configuration data is the association between the hosts and the individual storage (i.e. volume of data) in the storage system. See Column 1, Lines 7-9 and Column 5, Lines 23-25. Blumenau shows in his invention that when new

devices are added to the system a path discovery is executed in that it queries the network to identify other devices coupled to the network. See Column 6 Lines 62-63. The configuration data (i.e. mapping of host to specific storage) and the ports associated with the host and the specific storage (i.e. results of the path discovery) are stored in the configuration database (i.e. storage path database). See Column 9, Lines 14-35. The system administrator can initially build the storage path database (i.e. configuration database) manually during the initial stage of provisioning the Storage Area Network and continuously update the database as the need arises. See Column 6, Lines 45-55 and Column 8, Lines 13-15. Blumenau's also discloses that the system administrator functionality can be implemented in software. See Column 6, Lines 55-56. Blumenau's invention also gives, each host, ability to access the configuration database via a GUI or via a command line interface. See Column 18, Lines 9-24 and Figures 19-22. The allocation mechanism may reside in the host as a software utility. See Column 21, Lines 48-55.

Blumenau, however, fails to expressly address the issue of host failures. Blumenau fails to disclose an automatic method to detect host failures and the recovery steps required in validating the mapping between a host and storage unit after the host has experienced a failure.

Blumenau & Raz discloses a system able to detect host failure as shown in Figure 17. In the flowchart of Figure 17, the storage system port adapter when notified of a network state change such as host controller boot that occurs primarily after a host failure is detected. After the volume access table (i.e. storage path database) is

Art Unit: 2662

accessed in step 182, a set of checks in steps 183 and 186 are performed to validate the content of the table. In steps 184 and 188, the storage database is updated to reflect the re-mapping of the host to the storage. See Column 22, Lines 1-7. Blumenau & Raz disclose that each host has the ability to boot from local disk and do volume and topology reconfigurations (i.e. re-map storage to host) and in effect be able to do the steps indicated in Figure 17. See Column 32, Lines 43-45 and Column 33, Lines 13-22.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate a method for handling a host failure along with re-mapping host to storage, the motivation being an improved data storage system with fault tolerance, failover capability, and a valid storage system access request.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patent is cited to show the state of the art with respect to data transfer in a storage area network


U.S. Patent (6,675,268) to DeKoning et al

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Habte Mered whose telephone number is 571 272 6046. The examiner can normally be reached on Monday to Friday 9:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on 571 272 3088. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HM


RICKY NGO
PRIMARY EXAMINER